

No. 8.— *A new Species of Peripatus from Grenada, with observations on other species of the genus.*<sup>1</sup>

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It has been suspected for some time that *Peripatus* must occur upon the Island of Grenada, but so far as I have been able to ascertain no actual published reference to any specimens from there has yet been made. *Peripatus* was first discovered upon the island of St. Vincent which is only sixty-eight miles from Grenada, and as is well known, dates back to 1825 when Guilding described *Peripatus juliformis* which he believed to be a mollusc. The Grenada species is therefore of peculiar interest from an historical point of view, aside from its value in giving evidence of the faunal relationships of the island.

The opportunity of collecting the species I owe to Dr. Thomas Barbour, who made it possible for me to accompany Dr. G. M. Allen on a trip to the Island of Grenada during August and September, 1910. In addition to searching for reptiles, one of the main objects of the expedition was to obtain, if possible, specimens of *Peripatus*. During the first two weeks of our stay we collected rather thoroughly over the country about St. Georges which is situated on a beautiful little harbor near the southwestern extremity of the island. Here the hills rise to a height of about 600 feet above sea-level, and in places the environment seems well adapted to such moisture loving animals as *Peripatus*. Our search was entirely in vain, and none of the native boys who are very keen-eyed and observing, could recall ever having seen anything resembling them. We did not attach very much importance to this, however, for there is a large milliped related to *Julus* which is very common in damp decaying logs and stumps. This is of the same general size and form as *Peripatus* and the two would probably be confused under the name "Congeree" which is applied to the milliped.

Towards the center of the island, the hills rise considerably higher, attaining altitudes of over 2000 feet and supporting humid forests that form a typical "Regenwald." In one of these higher localities, surrounding a little lake there is a small forest reserve where the

<sup>1</sup>Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 44.

natural character of the vegetation remains practically unchanged. Here the rainfall, approximating 160 inches annually, is much greater and the temperature considerably lower, than in the coastal region. It was in this region, close to the border of the Grand Etang Lake that I unearthed the first specimen of *Peripatus*. It was concealed within a low, much decayed stump inside which it had evidently been living for some time, as some galleries within the wood left by wood-boring larvae, were smeared with the solidified glutinous secretion of its mucus glands. Entangled in this gummy substance were the chitinous remains of some arthropods upon which the *Peripatus* had evidently been feeding. Recognizable among these was a black harvestman (phalangiid) which is very commonly seen in decaying stumps.

During the next several days we made a very thorough search in the vicinity, and Dr. Allen was successful in finding two additional specimens. These were similarly hidden in decaying wood near the surface of the ground, not far from the lake. The species is apparently localized in this small region, for an equally thorough examination of the nearby hills and lower swampy areas brought to light no further examples. It would appear, therefore, that *Peripatus barbouri* is not only rare, but restricted in its distribution to one or probably several small areas among the high hills in the central part of the island.

The following table of the Caribbean species of *Peripatus* (*Péripates caraïbes*) is a translation of the one included in Bouvier's recent monograph,<sup>1</sup> with the addition of the Grenada species, and has been introduced for reference in discussing the distribution and relationships of the Antillean species.

1. Transverse dorsal folds numbering 24 to each segment, always very slightly distinct on account of numerous anastomosing and irregularities in the grooves which separate them; accessory papillae rare or absent, primary papillae small and subequal; crural tubercles present on the two praegenital pairs of legs in the male . . . . . Section of *P. jamaicensis*  
Dorsal folds numbering 12 to each segment; separated by continuous grooves except at the level of the legs where some of the grooves usually bifurcate . . . . . 2
2. Primary papillae on the dorsal surface of the body each with a quadrangular base separated by straight grooves parallel with the axis of the body; accessory papillae ordinarily small and few in number; crural tubercles present on the two praegenital pairs of legs in the male (at least in *P. perrieri*) . . . . . Section of *P. torquatus*.

<sup>1</sup> Bouvier, E. L. Monographie des Onycophores, Ann. Sci. Nat. Zool., 1905-1907, ser. 9, 2, p. 1-383, 13 pls.; 5, p. 61-318.

- Primary papillae of dorsal surface, each with a more or less rounded base; accessory papillae exhibiting very diverse stages of development . . . 3
3. Primary papillae of dorsal surface exhibiting great differences of size at all ages; some very predominant, of a cylindrical type; the others conical, smaller, and generally to the number of three between two large ones; these tubercles separated by rather broad intervals, where the accessory papillae are placed. Crural tubercles usually present on more than two praegenital pairs of legs in the male . . . Section of *P. juliformis*.
- Primary papillae of dorsal surface, all belonging to one type; in specimens of medium or large size, these papillae intergrade through all degrees of size, while in small specimens some are clearly preëminent. These papillae are much approximated, but it is not usual to find accessory papillae between them. Crural tubercles present on the two praegenital pairs of legs in the male . . . . . Section of *P. edwardsii*.

1st Section of *P. jamaicensis*.

Body slender; legs strongly approximated, at least 35 pairs in the male and at most 43 pairs in the female; frontal organs much clearer than the remainder of the integument . . . *P. jamaicensis* Grabh. & Chll.

2nd Section of *P. torquatus*.

1. Primary papillae almost reduced to a basal portion shaped like an abbreviated pyramid with feebly convex summit; the terminal portion of the papilla much reduced or absent, often represented only by a simple apical bristle (soie); accessory papillae very small, not at all numerous and but slightly apparent; creeping pads composed of four bands, with very distinct trace of a fifth . . . . . 2
- Primary papillae with a high, subconical base, and well-developed terminal cylinder; accessory papillae quite distinct . . . . . 3
2. Primary papillae subequal; 41-42 pairs of legs (perhaps a few less in the male); salivary glands terminating opposite the tenth or eleventh praeanal pair of legs . . . . . *P. torquatus* Kennel.
- Primary papillae very unequal; 28-32 pairs of legs; salivary glands terminating in the neighborhood of the third praeanal pair of legs.  
*P. perrieri* Bouvier.
3. 32 pairs of legs in the type female; nephridial tubercle on the fourth and fifth pair of legs free, or attached to the third band of the creeping pad by a narrow petiole; salivary glands terminating near the third praeanal pair of legs . . . . . *P. geayi* Bouvier.
- 27-28 pairs of legs in the female; nephridial tubercles broadly attached to the third band of the creeping pad, or entirely separate; salivary glands terminating opposite the 5th-7th praeanal pair of legs . . . 4

4. Nephridial tubercles broadly attached to the third band of the creeping pad; dorsal lozenge-shaped markings rather indistinct  
*P. ohausi* Bouvier.  
 Nephridial tubercles free from the creeping pad; dorsal lozenge-shaped markings very distinct . . . . *P. ohausi* subsp. *guianensis* Evans.

3rd Section of *P. juliformis*.

1. The larger primary papillae of the dorsal surface with a relatively reduced base and enlarged, often spherically dilated, apex; 28-30 pairs of legs in the male and 29-32 pairs in the female . . . . . 2  
 The larger primary papillae much more strongly developed toward the base than at the apex . . . . . 6
2. The smaller primary papillae very much reduced, often to a single one between two large ones, and separated by broad interspaces occupied by very small accessory papillae; crural papillae present on from 6 to 9 praegenital pairs of legs in the male . . . . . 3  
 The smaller primary papillae well-developed and usually placed in series of three between two large ones; accessory papillae equally well-developed; crural papillae present on three or four praegenital pairs of legs in the male . . . . . 4
3. Size large, female from 25-60 mm. in length; dorsal surface with more or less distinct lozenge-shaped markings; accessory papillae numerous  
*P. sedgwicki* Bouvier.  
 Size small, unique female 15 mm. in length; color uniform and very dark; accessory papillae less numerous . *P. sedgwicki* subsp. *bavayi* Bouvier.
4. Larger primary papillae distinctly grouped in sinuous longitudinal series; accessory papillae few and of small size *P. juliformis swainsonae* Ckll.  
 Larger primary papillae irregularly disposed, not forming longitudinal series . . . . . 5
5. Larger primary papillae sharply preeminent over the smaller ones; accessory papillae very evident . . . . . *P. juliformis* Guilding.  
 Smaller primary papillae notably more developed; accessory papillae becoming vestigial . . . . . *P. juliformis danicus* Bouvier.
6. Larger primary papillae with the apex poorly developed and of small dimensions; smaller papillae much reduced and ordinarily disposed singly between two large ones; accessory papillae very small; crural tubercles on two or three praegenital legs in the male; prostates between praeanal legs XII-XVIII; nephridial tubercles of legs IV-V broadly attached to the creeping pads; 29 pairs of legs in the male, and 30-33 in the female . . . . . *P. broelemanni* Bouvier.  
 Larger primary papillae with a terminal cylinder of rather large size; smaller ones well-developed and ordinarily disposed in threes between two large ones, accessory papillae intergrading through all sizes to the smaller primary papillae; crural tubercles present on two praegenital

- pairs of legs in the male; prostates between praeanal legs IV-VI; nephridial tubercles of legs IV-V free or feebly attached; 25 pairs of legs in the male and 28-31 pairs in the female . . . . . 7
7. Nephridial tubercles attached to the third band of the creeping pad by a constricted base; larger primary papillae well separated, by much more than their diameter at the base . . . . . *P. dominicae* Pollard.  
Nephridial tubercles free from the creeping pad; larger primary papillae more approximated . . . . . 8
8. Accessory papillae moderately well-developed and somewhat numerous.  
*P. dominicae* var. *antiguensis* Bouvier.  
Accessory papillae much reduced and less numerous  
*P. dominicae* var. *juanensis* Bouvier.

Section of *P. edwardsii*.

1. No incomplete segmental folds at the level of the legs; 29 pairs of legs in the male and 31-32 pairs in the female . . . *P. brasiliensis* Bouvier.  
Some of the segmental folds incomplete at the level of each pair of legs . . . 2
2. Nephridial tubercles of legs IV and V ordinarily lying in an emargination of the fourth band of the creeping pad, but without throwing it out laterally or dividing it into sections; creeping pads broad . . . . . 3  
Nephridial tubercles of legs IV and V free; pushing the fourth band out laterally, or dividing it into sections . . . . . 8
3. Accessory papillae intergrading in all degrees with the primary papillae which are of extremely varied dimensions . . . . . 4  
Primary papillae forming a series along the ridge of each fold and very distinct from the accessory papillae which are rarely intercalated among them; salivary glands terminating between the third and fourth praeanal pairs of legs . . . . . 7
4. Accessory papillae very numerous and often disposed in series of two or three between the primary papillae, thus interrupting the continuity of the latter; no lozenge-shaped color markings on the body above . . . 6  
The ridge of each fold is occupied by a series of papillae, some of these primary and of varied sizes, the others accessory; almost always numerous accessory papillae extend upward on the flanks along the sides of the folds; salivary glands terminating between the third and fourth praeanal pairs of legs . . . . . 5
5. Body with dorsal lozenge-shaped color markings; 27-30 pairs of legs in the male and 29-32 pairs in the female . . . *P. trinidadensis* Stuhlmann.  
Body entirely without dorsal color markings; 30-31 (usually 31) pairs of legs in the female . . . . . *P. barbouri*, sp. nov.
6. Salivary glands terminating between the third and fourth pairs of praeanal legs; nephridial tubercles free or slightly attached; 28-31 pairs of legs in the female . . . . . *P. imthurmi* Sclater.

- Salivary glands terminating between the seventh and tenth praeanal pairs of legs; nephridial tubercles broadly attached; 28 pairs of legs in the male . . . . . *P. evansi* Bouvier.
7. Primary papillae subequal, rarely separated by accessory papillae, the latter being disposed on the flanks of the folds; lozenge-shaped color markings on the body above; 28-29 pairs of legs in the male and 29-32 pairs in the female . . . . . *P. edwardsii* Blanch.  
Primary papillae of extremely varied dimensions, sometimes separated by accessory papillae; no dorsal lozenge-shaped markings; 28-32 pairs of legs in the female . . . . . *P. simoni* Bouvier.
8. Creeping pads of the usual size; nephridial tubercles deeply excavating the fourth band of the creeping pad and dividing it into sections; 26-28 pairs of legs in the male, and 30 in the female.  
*P. biolleyi* Bouvier.  
Creeping pads very narrow; nephridial tubercles pushing out the fourth band of the creeping pad laterally; the latter greatly reduced; 26 pairs of legs in the male, and 29-32 in the female . . . . . 9
9. Internal mandibular blades with one accessory tooth; primary papillae more nearly equal . . . . . *P. nicaraquensis* Bouvier.  
Internal mandibular blades usually with two accessory teeth; primary papillae strongly unequal . . . . . *P. nicaraquensis* var. *isthmicola* Bouvier.

PERIPATUS BARBOURI, sp. nov.

Plate 1.

*Form of body, dimensions.* The body is moderately elongate, and slightly flattened, but less noticeably so in the largest specimen. The following table gives the measurements of the three specimens:

	Largest	Type	Smallest
Total length of body . . . . .	50 mm.	53 mm.	38 mm.
Greatest width . . . . .	7.3 mm.	5.5 mm.	4.8 mm.

*Coloration.* So far as the three living specimens are concerned, the color of this species appears to be very constant. The upper side of the body is dark purplish slate-color, almost black, except when seen in sunlight when the velvety texture of the integument causes it to assume a distinctly grayish or glaucous tinge. The region directly along the median dorsal line is sometimes more nearly black, but not in all cases. Aside from this, however, the upper side is entirely without color pattern, and presents no indication of the

lozenge-shaped pattern exhibited by some of the related species. On the ventral side the color is much lighter and quite distinctly purplish pink. The legs are intermediate in color between the upper and under sides of the body. Above they are lighter than the dorsal surface of the body, but much darker than their undersides which are in turn very decidedly darker than the underside of the body.

*Integument.* The dorsal folds are sharply defined and the transverse grooves that separate them are deeply and clearly impressed. Between the furrows, the surface of each fold is regularly but not very strongly convex. Along the median line the number of folds is very uniform, twelve to each body segment, but laterally, particularly halfway to the base of the legs, many of the grooves coalesce. Near the middle body segments, there are on the average about two cases of coalescence to a segment, so that the folds are quite appreciably wider on the half of each side of the body which is next to the insertion of the legs. The dorsal median hyaline line is sharply defined, but is very much more distinct upon every second transverse fold, the alternating folds having only a very slight indication of it, either by reflected or by transmitted light. The hyaline organs (*organes clairs*) are not at all, or very feebly defined.

The primary papillae are confined almost entirely to the ridges of the folds, although they do not form a straight line except in very rare cases. Usually they form an irregular line which is quite clearly distinguishable from the smaller papillae along the slopes of the fold, but exceptionally, some of the larger papillae descend a considerable distance from the ridges. The slopes of the folds are furnished with the smaller papillae, many of which ascend on to the ridges between the largest ones. The large, medium sized and small papillae intergrade completely, so that it is impossible to distinguish between primary and accessory ones.

In most cases, however, there are about three, more rarely two or one, smaller papillae between two especially large ones along the ridges of the folds. The papillae are all of approximately the same form, with well-developed conical bases and greatly reduced, scarcely evident cylindroid apices. The hyaline streaks in the integument separating the bases of the papillae are very sharply defined and form an extremely irregular network which encloses areas of all shapes and sizes, most of them plainly polygonal in form.

*Mandibles.* The external blade of the mandibles bears two accessory teeth,

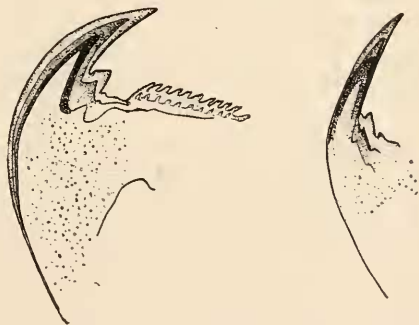


FIG. 1.—*Peripatus barbouri*, sp. nov. Outer blade of mandible showing denticles, and outer portion of inner blade.

of which the apical one is well-developed, but the inner one is scarcely half so long and quite inconspicuous. It bears twelve denticles on the single blade upon which I have been able to make an accurate count. The inner blade bears two accessory teeth, of which the basal one is much the smaller, and reduced to less than half the length of the apical one.

*Legs.* All of the three adult females before me bear 31 pairs of legs, but in a well-developed embryo removed from one adult, there are only 30 pairs. I cannot be positive, but suspect that the embryo is a female. From this it would appear very probable that 31 pairs of legs is the commonest number for females of the species, and that variations above and below this mean will be found as is the case among the other species.

The nephridial tubercles of the fourth and fifth pairs of legs are broadly attached to the third band of the creeping pad, although in some instances the connection is slightly narrower than that shown in figure 2, which is taken from the largest specimen. However, the convex form of the tubercle gives it the appearance at first sight of being separated from the creeping pad, although their continuity is readily to be traced.

The genital opening is exactly between the bases of the penultimate pair of legs.

*Anatomy.* The position of the ovaries has been determined from the largest specimen, which contained embryos. The ovaries lie approximately between the legs of the sixth praeanal pair, and their ligaments are distinctly separate all the way to the base of the ovaries, although they lie very close together. The salivary glands terminate between the third and fourth praeanal pairs of legs.



FIG 2.—*Peripatus barbouri*, sp. nov. Fifth leg of female showing position of nephridial tubercle.

*Habitat.* All three specimens were taken at an altitude of 1800 feet at Grand Etang on the Island of Grenada, British West Indies.

The closest affinities of the Grenada *Peripatus* are evidently with *P. trinidadensis* from Trinidad, which lies to the southwest of Grenada, its northern coast removed about 90 miles from the southern extremity of the latter. Two species are known to occur in Trinidad, but the second, *P. torquatus* is very different from *P. barbouri* and approaches nearest to *P. jamaicensis* in the large number of legs (41–42 pairs) while *P. barbouri* has only 31 pairs. *Peripatus torquatus* is also very conspicuously banded with yellow just behind the antennae and the color of the dorsal surface is reddish brown. The form and arrangement of the papillae is not at all similar, for in *P. torquatus* there is no gradation between primary and accessory papillae; the latter are



very few in number, and the bases of the primary ones are rectangular — not irregularly polygonal as in *P. barbouri*. A remarkable similarity is seen, however, in the bifurcation of two transverse folds on each body segment toward the middle of the dorsum. This occurs in both species in exactly similar fashion.

With *P. trinidadensis* the affinities of the Grenada species are very great, as well as with *P. imthurmi*, *P. sedgwicki*, and certain forms of *P. dominicae*.

From *P. trinidadensis*, it may be distinguished by the entire absence of dorsal lozenge-shaped color markings, and by the not very prominent transverse tegumentary folds. There appear also to be more very small accessory papillae, although middle sized ones showing all gradations to the primary papillae are always present on the folds, but otherwise the resemblance between the two forms is extremely close. Just as *P. trinidadensis* is more or less intermediate between *P. imthurmi* from Guiana and the West Indian *P. dominicae* with its varieties, *P. barbouri* must be interpolated between *trinidadensis* and *dominicae*. There can be no doubt, however, that the similarity to the former is much greater than to the latter since the gradation between the sizes of tegumentary papillae at once distinguishes it from *P. dominicae*, which falls on this account into a different group in Bouvier's classification. The latter species has fewer legs (29 pairs) on the average also, at least in the typical form, although the variety *antiguensis* may possibly average 30 or 31 pairs.

One is led to believe, therefore, so far as the evidence furnished by the Grenada Peripatus is concerned, that the faunal relationship of Grenada with Trinidad is much closer than with St. Vincent to the north as the latter island supports *Peripatus juliformis*, a form that extends northward with varietal variations as far as St. Thomas and Jamaica, and one which is widely different from *P. barbouri*.

Unfortunately no Peripatus has been, so far, reported from Tobago, which lies to northeast of Trinidad and southeast of Grenada. The genus undoubtedly must be represented there, and one may surmise that forms identical, or at least very close to those on Trinidad will be found as the fauna of Tobago is but little different from that of Trinidad.

From the foregoing it will appear that Grenada probably represents the northern limit of extension of the group so well-developed in the northern coastal region of South America. That these forms may extend still further to one of the Leeward Islands, is possible since Bouvier has described from Guadeloupe a variety *barayi* which he

regards provisionally as belonging to *P. sedgwicki*. This he believes may really represent a distinct species, however, when known from more extensive material. On the north several forms show a close relationship of St. Vincent and Dominica to the more northern islands; thus *P. dominicae* extends in varietal forms from Porto Rico to Antigua and as far south as Dominica, while the varieties of *P. juliformis* extend from Jamaica through St. Thomas to St. Vincent on the south.

PERIPATUS JULIFORMIS GUILD, VAR. SWAINSONAE COCKERELL.

Plate 2, figs. 1-2.

I have had the opportunity of examining a large series of this Jamaican species collected by Messrs. M. Grabham and Thomas Barbour at Bath, Jamaica, and presented to the Museum of Comparative Zoölogy by Dr. Barbour. There are 114 specimens in all, the majority of them females, but with a good series of males.

These have been examined to ascertain the amount of variation in the number of legs, and the results are tabulated in figure 3a. The number varies from 27 to 35 with 28 pairs as the mode for males and 33 pairs for females, and in both sexes the modal number is far more common than all the other numbers together. Since Bouvier has recorded the number of legs in all the specimens of this species which he has seen, I have added his data in dotted lines, and it will be seen that these follow closely the solid lines representing the present material. In figure 4a I have added the two curves together, and believe that this represents quite closely the actual range of variation, as the sum is based on nearly 200 specimens. It will be seen that there is hardly any overlapping of the male and female polygons, so that the sexes may be almost positively separated by the number of legs, the males having less than 30 and the females over 30.

The color of the present series of specimens is somewhat different from that described by Bouvier for individuals from exactly the same locality in Jamaica, and I suspect that the difference is due to the length of time they have remained in alcohol. Bouvier describes the color as grayish above, sometimes paler and delicately tinged with greenish yellow, or sometimes darker and tending toward dark gray. There is great variation in the shade, but all of the better preserved and unfaded individuals have the dorsal surface very dark

gray, almost blackish, with a faint brown-purple cast. Faded specimens pass through various stages of yellowish and purplish gray, becoming very pale and showing to the unaided eye very plainly the dark tips of the primary papillae which are so placed as to form

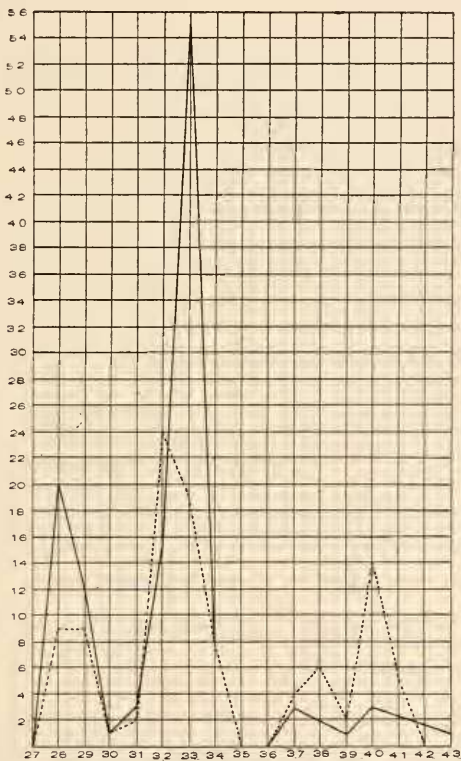


Fig. 3a.

Fig. 3b.

FIG. 3a.—*Peripatus juliformis* Guild. var. *swainsonae* Ckll., curve showing variation in number of pairs of legs. Fig. 3b. Same for *Peripatus jamaicensis* Grabh. & Ckll. Solid lines based on present material; dotted line on that examined by Bouvier.

sinuous or discontinuous longitudinal lines along the back (Plate 2, figs. 1-2). The underside is uniformly paler, with the same slight purplish or pinkish brown tinge seen in much darker shades above.

In the present collection from Bath a number of specimens of *Peripatus jamaicensis* Grabh. and Ckll. are included, taken at the